Remarks/Arguments:

Claims 1-18 are pending in the application. Claim 18 is currently amended.

Rejection under 35 U.S.C. § 112

Claim 18 stands rejected under 35 U.S.C. § 112, 1st paragraph, for failing to comply with the written description requirement. The applicants respectfully submit that the claim was adequately described by the specification. Nonetheless, in order to expedite prosecution, the applicants have amended claim 18 to recite "wherein the one or more electrocatalyst metals is supported, but not supported on a graphite support." This language is supported by the specification (Spec. pgs. 7-8, lines 32-1), and claim 18 should now conform with the requirements of Section 112.

Rejection under 35 U.S.C. § 103

Claims 1-18 stand rejected as unpatentable over U.S. Patent No. 5,716,437 ("Denton") in view of U.S. Patent No. 6,403,245 ("Hunt"). Applicants traverse this rejection.

"To establish a *prima facie* case of obviousness, ... the prior art reference (or references when combined) must teach or suggest all the claim limitations." M.P.E.P. §2143. Additionally, as set forth by the Supreme Court in KSR Int'l Co. v. Teleflex, Inc., 550 U.S. _ (2007), it is necessary to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the prior art elements in the manner claimed.

Independent claim 1 recites "an electrocatalyst ink comprising a particulate electrocatalyst consisting of one or more optionally supported electrocatalyst metals; one or more proton-conducting polymers; and particles consisting of graphite which are present at a **loading of 1 to 40 weight % with respect to the weight of the electrocatalyst**."

The Office Action relies upon Denton for disclosing an ink composition and states that the "Denton reference failed to teach utilizing a graphite material in the catalyst ink." (O.A. pg. 4). Denton fails to teach or suggest the use of any graphite material or any loading percentages with respect to the weight of the electrocatalyst.

The Office Action relies upon Hunt for disclosing an electrically conductive graphite. For the reasons set forth below, applicants respectfully submit that Denton in view of Hunt does not teach or suggest the claimed invention.

With respect to claim 1, the applicants contend that there are at least two reasons why Denton and Hunt fail to render this claim obvious. First, Denton and Hunt, alone or in combination, fail to teach or suggest the loading weight percentage range with respect to the electrocatalyst recited in the present invention as claimed in claim 1. This shortcoming is not addressed in the Office Action, and no citation was provided for rejecting the claims. Second, and alternatively, there is no motivation to combine the references because a skilled person would not use the teaching of Hunt of adding one conducting material (graphite fiber) and apply it to Denton which already has a conducting material present.

Elaborating on the first reason mentioned above, Denton and Hunt fail to teach, and in fact Hunt teaches away from, a graphite loading of 1 to 40 weight % with respect to the electrocatalyst as called for by claim 1. Claim 1 recites in part, "particles consisting of graphite which are present at a **loading of 1 to 40 weight % with respect to the weight of the electrocatalyst**." In general, Hunt is directed to a membrane exchange assembly (MEA) comprising a layered membrane with an electrically conductive material, a polymer film, and a catalytic material. The only recitation of particulates is in the claims, for example in claims 6, 7 and 13. Claim 7 further specifies "particulates comprising graphite." Every reference to graphite in the specification discusses graphite fiber. See e.g. Hunt at col. 3, lines 26-30 and Fig. 6 which depicts the graphite fiber 74.

Regardless of the specific form of graphite, Hunt simply fails to set forth any loading requirements of graphite. One cannot even ascertain an exemplary loading of graphite from the Examples or elsewhere in the specification because no amounts of the constituents are ever provided. The only possible inference regarding graphite loading that one could draw would be from the x-ray diffraction data shown in Fig. 9. The x-ray diffraction pattern indicates a loading of graphite which is considerably higher than the percentage of platinum (i.e., the electrocatalyst). Consequently, if Hunt suggests any type of graphite loading, then it would be a loading higher than 100 weight % with respect to the electrocatalyst, and certainly well above 40 weight %. Therefore, Hunt fails to teach the loading of 1 to 40 weight % with respect to the electrocatalyst. Because the examiner recognizes that Denton fails to teach this limitation as well, claim 1 is patentable over these references because it contains a limitation not taught by them.

Turning to lack of motivation to combine, one of ordinary skill in the art would not be motivated to combine these references nor have any reason to do so as required by KSR. Hunt adds the graphite fibers to the catalyst composition in order to improve the conductivity between the membrane and the catalyst layer. Denton already had a conducting material present, namely the carbon materials. A skilled person would not use the teaching of Hunt by going from no conductive material to one conducting material, namely graphite fiber, and apply it to Denton which discloses an ink already having a conducting material present. The particles of graphite in the present invention are in addition to any carbon support for the catalyst metal. Moreover, as set forth above, Hunt fails to teach the claimed ingredients within the proper proportions, and in fact teaches away from the proportions of the present invention. Accordingly, a *prima facie* case of obviousness has not been presented, and the rejection should be withdrawn.

Independent claim 9 recites:

> A process for preparing an electrocatalyst ink, said process comprising **mixing** a particulate electrocatalyst consisting of one or more optionally supported electrocatalyst metals with one or more proton-conducting polymers and particles consisting of graphite in a liquid medium, wherein the graphite is present at a loading of 1 to 40 weight % with respect to the weight of the electrocatalyst.

In addition to the point made above in which Denton and Hunt fail to disclose the graphite loading weight percent with respect to the electrocatalyst of the present invention, Hunt also fails to teach or suggest a mixed electrocatalyst ink. Hunt is directed to deposited catalyst layer(s) formed by combustion chemical vapor deposition (CCVD). The step of mixing a particulate catalyst, one or more proton-conducting polymers and particles consisting of graphite, is far removed from forming a catalyst layer by CCVD. The Examples in the specification on pg. 10, lines 10-33 of the present invention discuss the mixing process where the components are dispersed using a high-shear mixer which produces a smooth ink. Because Hunt is not directed to an ink, it fails to teach or suggest uniform distribution of components throughout the electrocatalyst ink and producing a uniform layer of catalyst therefrom.

Claim 18 depends upon claim 1 and is patentable for the reasons discussed above in connection with claim 1. In addition, claim 18 as currently amended recites that "the one or more electrocatalyst metals is supported, but **not** supported on a graphite support." On the other hand, Hunt uses graphite fibers as the support for the catalyst metal. The Office Action alleges at pg. 4 that "it would have been obvious to one of ordinary skill in the art to arrive at the ink composition for use in electrode as taught by Denton in view of Hunt by substituting the carbon with graphite as taught by Hunt." If this "substitution" were made, the resulting product would have graphite as a support, because the carbon of Denton served as a support. Furthermore, Hunt explains the use of the graphite fiber as the catalyst support at col. 9, lines 40-45, which states "adhering to the graphite fibers and coating the fibers are the platinum crystals and Nafion particles." See also, Fig. 6 showing the graphite fibers supporting the platinum nanoparticles. Even using the rationale for combining the references set forth at pg. 5 of the Office Action, graphite would be a support but along with carbon. In either of these rationales provided by the examiner, graphite is serving as a support. Accordingly, the references as combined by the examiner fail to meet each and every limitation specified by claim 18.

Applicants respectfully submit that independent claims 1 and 9 are in condition for allowance. It is respectfully submitted that dependent claims 2-8 and 10-18 are in condition for allowance, for at least the reasons set forth above.

Conclusion

For all of the foregoing reasons, Applicants respectfully request reconsideration and allowance of the claims. Applicants invite the examiner to contact their undersigned representative if it appears that this may expedite examination.

Respectfully submitted,

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